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ABSTRACT

A study examined how Arkansas students' achievement is related to poverty, school and district size, and the interaction between these factors. Achievement test scores from grades 4, 5, 7, 8, and 9 in all Arkansas schools were supplied by the Arkansas Department of Education. Poverty levels were determined by percentage of students receiving subsidized meals. Findings indicate that the higher the poverty level in a community, the more damage larger schools and school districts inflicted on student achievement. In more affluent communities, the impact of school and district size was quite small, but the poorer the community, the stronger the influence. The achievement gap between children from more affluent and those from less affluent communities was narrower in smaller schools and smaller districts, and wider in larger schools and larger districts. Smaller schools were most effective against poverty when they were located in smaller districts; they were less effective when located in larger districts. Poverty dampened student achievement most in larger schools located in larger districts. The relationship between school size, poverty, and student achievement was as much as three times greater in schools with the largest percentages of African American students. Recommendations include retaining existing smaller schools, building new small schools, and breaking up larger schools and districts. Six tables and figures present study results. (TD)

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ED 462 229

SMALL WORKS IN ARKANSAS

How Poverty and the Size of Schools and School Districts Affect School Performance in Arkansas

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A Rural School and Community Trust Summary of Recent Research

March 2002

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Through advocacy, research and outreach, the Rural Trust strives to create a more favorable environment for rural schooling, for student work with a public audience and use and for more active community participation in schooling.

Founded as the Annenberg Rural Challenge in 1995, the Rural Trust today works with more than 700 rural elementary and secondary schools in 35 states.

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How Poverty and the Size of Schools and School Districts Affect School Performance in Arkansas

A Rural School and Community Trust Summary of Recent Research

This is a summary of a study conducted by Ohio University researchers Jerry D. Johnson, Craig B. Howley, and Aimee A. Howley. This summary is a publication of the Rural School and Community Trust and the views and interpretations provided are those of the Rural School and Community Trust, and not necessarily those of the study authors. The full study can be retrieved through the ERIC Clearinghouse or it can be accessed at the web site of the Rural School and Community Trust at www.ruraledu.org.

The full study may be cited as: Johnson, J.D., Howley, C.B., & Howley, A.A. (2002). Size, excellence, and equity. A report on Arkansas schools and districts. Athens, OH: Ohio University, College of Education, Educational Studies Department. ERIC Document Reproduction Service (forthcoming).

This summary of the study may be cited as: Small Works in Arkansas: How Poverty and the Size of Schools and School Districts Affect Student Achievement in Arkansas. A Summary by the Rural School and Community Trust of research conducted by Jerry D. Johnson, Craig B. Howley, and Aimee A. Howley. Rural School and Community Trust. 1825 K St. NW, Suite 703, Washington, DC, 20006. March 2002.

Please direct questions or comments to Marty Strange, Policy Director, Rural School and Community Trust, P.O. Box 68, Randolph, VT 05060 or to martystrange@ruraledu.org.

A series of studies[1] in seven states (Alaska, California, Georgia, Montana, Ohio, Texas, and West Virginia) indicates that smaller schools reduce the harmful effects of poverty on student achievement and help students from less affluent communities narrow the academic achievement gap between them and students from wealthier communities. The implication is that the less affluent a community, the smaller the school and school district serving that community should be in order to maximize student achievement. The present study conducted by Ohio University researchers extends this analysis to Arkansas. The findings are remarkably consistent with those from the other states.

The Arkansas findings are:

1. The higher the level of poverty in a community served by a school, the more damage larger schools and school districts inflict on student achievement. In more affluent communities, the impact of school and district size is quite small, but the poorer the community, the stronger the influence.
2. The achievement gap between children from more affluent and those from less affluent communities is narrowed in smaller schools and smaller districts, and widened in larger schools and larger districts.
3. Smaller schools are most effective against poverty when they are located in smaller districts; they are less effective when they are located in larger districts. Poverty dampens student achievement most in larger schools located in larger districts.
4. The relationship between school size, poverty, and student achievement is as much as three times greater in schools with the largest percentage of African American students.

[1]Bickel & Howley, 2000; Howley & Bickel, 1999; Friedkin & Necochea, 1988; Huang & Howley, 1993.

Methodology

Regression and correlation analyses were used to measure how *achievement levels* of students in various grades are related to:

- The level of *poverty* in the school and district
- The school and district *enrollment size*
- The *interaction between these two factors.*

The researchers looked for two kinds of effects:

- The *"excellence effect"* of school size — Does the size of a school or a school district affect its students' academic performance, and does the nature and extent of that effect depend on the level of poverty in the community the school serves? Regression analysis is used to indicate how achievement scores vary as school size varies in communities of differing poverty levels.
- The *"equity effect"* — Is poverty's power over student achievement greater in smaller or in larger schools? Correlation analysis is used to show whether the link between poverty and low levels of achievement is stronger in schools above or below median size.

For this research, the unit of analysis is the school and the district, not the individual student. This is appropriate in today's policy environment because teachers, administrators, and leaders are increasingly held accountable for the school-level aggregate performance of their students.

The Data

Student achievement test scores from all tested grades in all Arkansas schools and all Arkansas school districts[2] were supplied by the Arkansas Department of Education. For schools, these data included three-year averages for the Stanford Achievement Test 9 for each of the grades 5, 7, and 9 (for years 1998, 1999, and 2000), and two-year averages for the Arkansas Benchmark test scores in literacy and math for grade 4 (1999 and 2000) and one year only for the Arkansas Benchmark scores for grade 8 (2000 only). For district scores, data was for the year 2000 only.[3] The SAT data were reported as the mean percentile rank of students in each school or district, and the Arkansas Benchmark test data were reported as the proportion of students scoring at the "proficient" level or higher.

Definitions

School size was measured as the number of students enrolled per grade offered at the school, to control for the fact that schools offer a widely varying number of grades. District size was measured as the total number of students enrolled.

There was no fixed definition of what constitutes a "small" or "large" school. The excellence (regression) analysis simply shows how achievement varies along the full continuum of school size and of poverty. The equity (correlation) analysis compared "larger" and "smaller" schools by dividing all schools at the median school size.

The poverty level in a school was measured as the average percentage of students who received free or reduced price lunches during the years 1998, 1999, and 2000. For districts, the poverty level was the percentage of students receiving subsidized meals for the year 2000.

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[2]There were fewer than a dozen schools and districts for which data could not be obtained from the Arkansas Department of Education for technical reasons.

[3]Test scores were reported for two groupings of students: (1) all students combined, and (2) all "general" students, excluding special education and Limited English Proficiency students. Results were similar for both student groupings, but the results are reported only for the general students because the authors considered these test scores more reliable due to widely divergent conditions under which special education and LEP students are tested.

Results

1. The "Excellence Effect" of Small Schools

In regression analyses performed on all seven tests, the interaction between poverty and school size had a negative effect on student achievement — the poorer the community served and the bigger the school, the worse students performed. This relationship was statistically significant in all seven test results.[4]

Moreover, while larger schools actually had a positive effect on achievement in the most affluent communities in many of the previous state studies, the effect of larger schools was negative across almost the entire economic spectrum in Arkansas.

For the poorest one-half of communities (Arkansas schools in which at least 37% to 56% of the students receive subsidized meals, depending on the grade being analyzed), the negative effect of larger schools was often pronounced. For example, an increase of just 33 students per grade in a school that includes the tenth grade, is among the smallest 10 percent in the state, and serves one of the poorest 10 percent of the communities (such schools now average just 47 students per grade), would be predicted to lower tenth-grade SAT test scores by about 3 percentile ranks. That could be enough to jeopardize the school's academic standing under the state's accountability system.

The study authors conclude that ***increasing the size of schools serving students from the poorest 50 percent of Arkansas communities would tend to lower student performance below current levels on state mandated tests.***

2. The "Excellence Effect" of Small Districts

In some of the previous state studies in this series, the statistical evidence of benefits from having smaller districts serving poorer communities was relatively weak compared to the benefits of smaller schools serving these communities. This was not the case in Arkansas. On all seven regression equations, the interaction between district size and poverty had a negative effect on achievement — the larger the district, the worse children from poorer communities performed. The relationship was statistically significant on six of the seven test results (for all tests except the Grade 8 Literacy test). In fact, for five of the seven comparisons, the net negative effect of large size was more substantial for districts than for schools (see Tables 3 and 6 in the full study report, not reproduced here).

Again, in the most affluent 10 percent of communities, there was weak evidence of benefits from larger districts. But for all communities below the 50th percentile in poverty, there were pronounced negative effects from larger districts.

The authors conclude ***that consolidating or merging districts serving students from the poorest 50% of Arkansas communities (those with subsidized school lunch rates of about 48% or more) would likely lower student performance below current levels on state mandated tests.*** Enlarging districts for more affluent communities would not likely result in increased test scores for any except the very most affluent 10 percent.

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[4]Since data were drawn from virtually all schools and districts in the state, and not merely from samples, tests of statistical significance are not strictly relevant. The actual relationship between these variables is revealed in the statistic. However, tests of significance are useful for the practical purpose of emphasizing the magnitude of these relationships.

3. The "Equity Effect" of Small Schools

The "excellence effect" discussed above considers how size and poverty interact to affect the absolute level of test scores in a school or district. But it is also important to know whether the achievement gap between schools serving more affluent communities and those serving less affluent communities is wider or narrower among communities served by small schools or among those served by larger schools. Do children from poorer communities do relatively better or worse compared to children from wealthier communities when similar sized schools serve both kinds of communities?

The other state studies in this series have produced remarkably consistent results on this question, and the Arkansas results are just as conclusive: ***Small schools weaken poverty's power over student achievement and narrow the achievement gap between children from more affluent communities and those from less affluent communities.***

This analysis consists of dividing all schools in the state into two groups at the median size, so that an equal number of "larger" and "smaller" schools can be compared. Because Arkansas has many small schools, this median point is quite small — ranging from 55 students per grade for schools offering fifth grade to 68 students per grade for schools offering eighth grade. Researchers then calculated the percentage of the variance[5] in test scores within each group that is statistically explained by the level of the poverty in the communities served by schools. We call this statistic ***"poverty's power rating"*** because it suggests how much negative impact poverty has over student achievement in each group. The more power poverty has over achievement, the wider the achievement gap between wealthier and poorer communities.

For all tests and in all grades, poverty's power rating in Arkansas' smaller schools was weak compared to its power rating in larger schools (see Table 1 and Figure 1 on page 12). In general, small schools cut poverty's power rating by at least one-fourth and by as much 90 percent. In eighth grade, poverty virtually disappears as a factor in student performance in small schools.

4. The "Equity Effect" of Small Districts

A similar analysis was conducted for larger and smaller districts. Again, for all tests and in all grades, poverty's power rating in Arkansas' smaller districts was weak compared to its power rating in larger districts (see Table 2 and Figure 2 on page 13). ***In general, smaller districts cut poverty's power rating by more than half and by as much 85 percent.*** Again, in eighth grade, poverty virtually disappears as a factor in student performance in small schools.

5. Sorting Out School and District Size

Does the performance of larger or smaller schools depend on the size of the district in which they are located? Can the disadvantages of making larger districts through consolidation be offset if the schools within these enlarged districts are kept small? This is an important issue because some believe that consolidating or merging districts will save money.

For test results at each grade level and subject area, the researchers divided all school districts into two groups, splitting them at the median size enrollment into "larger" and "smaller" districts. The schools within these two groups of districts were then divided at the median enrollment into "larger"

[5]The variance is the square of the correlation coefficient.

and "smaller" schools. For three of these four groupings,[6] the variance was calculated to measure poverty's power rating over school performance. The results (see Table 3 and Figure 3 on page 14) were consistent with a similar analysis undertaken in the Georgia report in this series of studies.

Poverty's negative effect on school performance is greatest in larger schools located in larger districts, in all grades and for all tests. It is appreciably lower for smaller schools operating in larger districts, in all grades and for all tests. But it is dramatically lower for smaller schools located in smaller districts, again, in all grades and for all tests. Smaller schools operating in smaller districts cut poverty's power on average by about twice as much as smaller schools that have to operate in larger districts.

The authors conclude that within larger districts, there is something to be gained in school performance by making schools smaller. There is even more to be gained by breaking up the larger districts themselves. There is very little to be gained in school performance by enlarging smaller schools, whether they are in larger or smaller districts, except in a few of the wealthiest communities (and not much achievement gain can be predicted in those few communities, either).

Most important in the context of Arkansas' current debate over school structure, the authors conclude that consolidating smaller districts is predicted to lower school performance in the poorest half of Arkansas' communities, even if smaller schools are maintained in those newly consolidated districts.

6. The Effects of Race

Schools were divided into two groups:

- The one-quarter of schools with the highest percentage of African American students
- The three-quarters of schools with the lowest percentage of African American students

This analysis revealed that African Americans disproportionately attend larger schools, especially at the grade 10 testing level. This is significant because the excellence effect described above was strongest at the grade 10 level, which is also the age level at which students are most at-risk of dropping out of school. The study findings are that poverty and the relationship between poverty and school size were three times as powerful in high-percentage African American schools than in other schools. This means that the negative effects of poverty and its interaction with school size are even more severe in schools serving predominately African American students than in other schools.

What Does This Mean for Arkansas?

The data and results from this study can be used to predict what would happen to test scores of students in a school or school district of any particular size, serving a community of any particular level of wealth, if those students were to attend a school or district that was larger or smaller. The study includes a procedure for making this calculation.

For example, consider a school with the characteristics similar to those of the Lake View elementary school that is part of the district that filed the school finance lawsuit pending before the Arkansas Supreme Court. Lake View elementary is among the smallest 10 percent of schools in the state, and it serves a community that is among the poorest 10 percent in the state. According to the results of this study, a school that includes a fourth grade at the 10th percentile in size and at the 90th percentile in poverty (slightly bigger than Lake View and not quite as poor) would have

[6]There were not enough schools in the grouping of "larger schools in smaller districts" to calculate the statistic.

about 21 students per grade and about 86% of them would be eligible for subsidized school lunches. ***According to study results, if the size of that school were doubled, the proportion of fourth graders scoring at or above proficiency levels on literacy would be predicted to fall by more than three percentage points, while the proportion scoring proficient or above on math would be predicted to fall by more than four percentage points.***

Likewise, a district that was at the 10th percentile in size (about 273 students, considerably more than the Lake View District which has about 200) and served a community at the 90th percentile of poverty (72% subsidized meal participation rate, lower than Lake View's 94% rate) would be predicted to experience substantial declines in district performance if it were consolidated with other districts to form a larger district. ***For example, if such a district became part of a district with about 1,160 students (still a small district by national standards), the proportion of students from that school who score proficient or above would be predicted to fall by nearly 6 percentage points in grade 8 math and more than 10 percentage points in grade 4 math.***

Study Authors' Conclusions and Recommendations

The authors conclude that "widespread consolidations of either districts or schools would be predicted to increase inequity and to degrade academic accomplishment in most Arkansas schools and districts" and would be a costly mistake. Instead, they recommend Arkansas should:

- Build on the strengths of smaller district size;
- Retain existing smaller schools and build new ones; and
- Consider breaking up the larger schools and larger districts, especially since many of them serve lower income African American students in urban areas.

Commentary from the Rural School and Community Trust

This study is perhaps the strongest yet in a series of state-level studies that consistently show that small works when it comes to schools and school districts serving most communities, but especially those that serve children and youth from poorer socio-economic backgrounds. It is among these students that inequities in school finance systems produce the harshest results. The widening achievement gap between these students and those from more affluent communities is among the saddest realities in American education.

The Lake View lawsuit has focused the state's attention on the equity and adequacy of school funding. Unfortunately, but perhaps predictably, it has also brought calls for consolidation of schools or districts as a means of achieving cost savings. This study clearly shows that trying to save money through consolidation of either schools or districts, would predictably have the perverse effect of actually widening the achievement gap and the worsening the inequities in Arkansas education. It would be a "cure" that would worsen the disease.

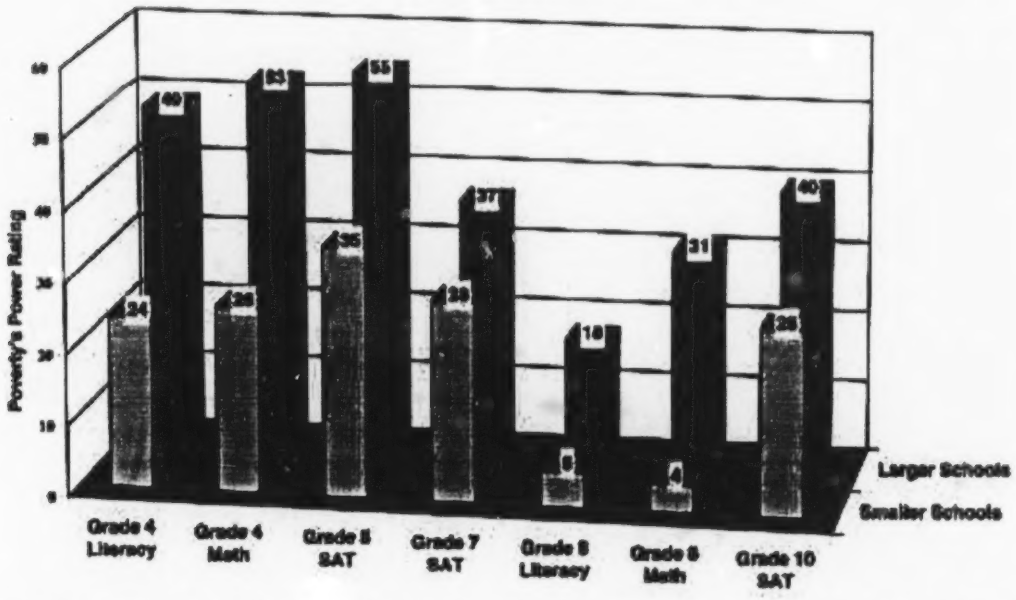
Moreover, as the examples cited above indicate, the predicted lowering of school performance for the smallest schools serving the poorest communities would make it much more difficult for many schools to meet the test score "trend and improvement" standards set out in the Arkansas Comprehensive Testing, Assessment, and Accountability Program. Schools or districts that fail to meet these improvement standards will fall under various sanctions, and will require more state oversight and supervision. This will increase costs, and likely more than offset any fiscal gains to come from consolidation. It would be penny wise and pound foolish to try to spend less by making schools or districts bigger.

Table 1. Arkansas' Small Schools Slash Poverty's Power Over Achievement.

	Poverty's Power Rating Is ...		Smaller Schools Cut Poverty's Power By ...	
	Larger Schools	*Smaller Schools*	*Points*	*Percent*
Grade 4				
Benchmark — Literacy	49	24	25	51
Benchmark — Math	53	26	27	51
Grade 5				
SAT 5	55	35	20	36
Grade 7				
SAT 7	37	28	9	24
Grade 8				
Benchmark — Literacy	18	5	13	72
Benchmark — Math	31	4	27	87
Grade 10				
SAT 10	40	26	14	35

Notes: "Larger" means above median sized enrollment; "Smaller" means below median sized enrollment. The "Power Rating" is the portion of the variance for achievement scores that can be explained by the level of poverty in the school as measured by free and reduced price lunch. It is calculated by squaring the correlation coefficient.

Figure 1. Arkansas' Small Schools Slash Poverty's Power Over Achievement.



Poverty's Power Rating is the proportion of the variance in average test scores that is explained by the level of poverty among students in a school.

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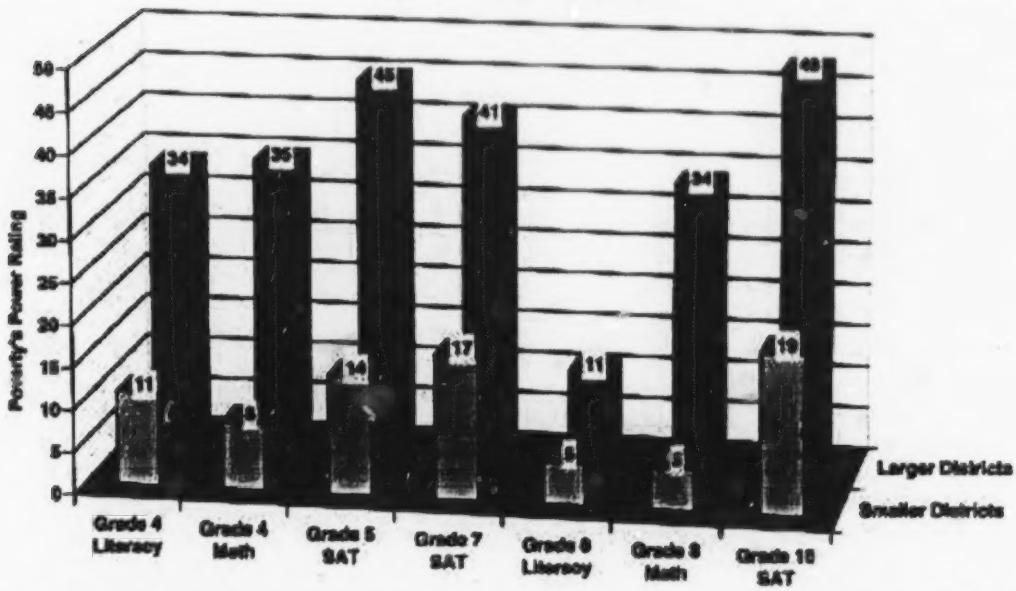
Table 2. Arkansas' Smaller School Districts Slash Poverty's Power Over Achievement.

	Poverty's Power Rating Is ...		Smaller Schools Cut Poverty's Power By ...	
	Larger Schools	*Smaller Schools*	*Points*	*Percent*
Grade 4				
Benchmark — Literacy	34	11	23	68
Benchmark — Math	35	8	27	77
Grade 5				
SAT 5	45	14	31	69
Grade 7				
SAT 7	41	17	24	59
Grade 8				
Benchmark — Literacy	11	5	6	55
Benchmark — Math	34	5	29	85
Grade 10				
SAT 10	48	19	29	60

Notes: Larger" means above median sized enrollment; "Smaller" means below median sized enrollment. The "Power Rating" is the portion of the variance for achievement scores that can be explained by the level of poverty in the school as measured by free and reduced price lunch. It is calculated by squaring the correlation coefficient.

Figure 2. Arkansas' Smaller School Districts Slash Poverty's Power Over Achievement.



Poverty's Power Rating is the proportion of the variance in average test scores that is explained by the level of poverty among students in a school.

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Table 3. Arkansas' Smaller Schools Are Most Effective Against Poverty When Part of Smaller Districts, and Less Effective When Part of Larger Districts.

Lower Numbers Mean Poverty Has Less Impact on Test Scores.

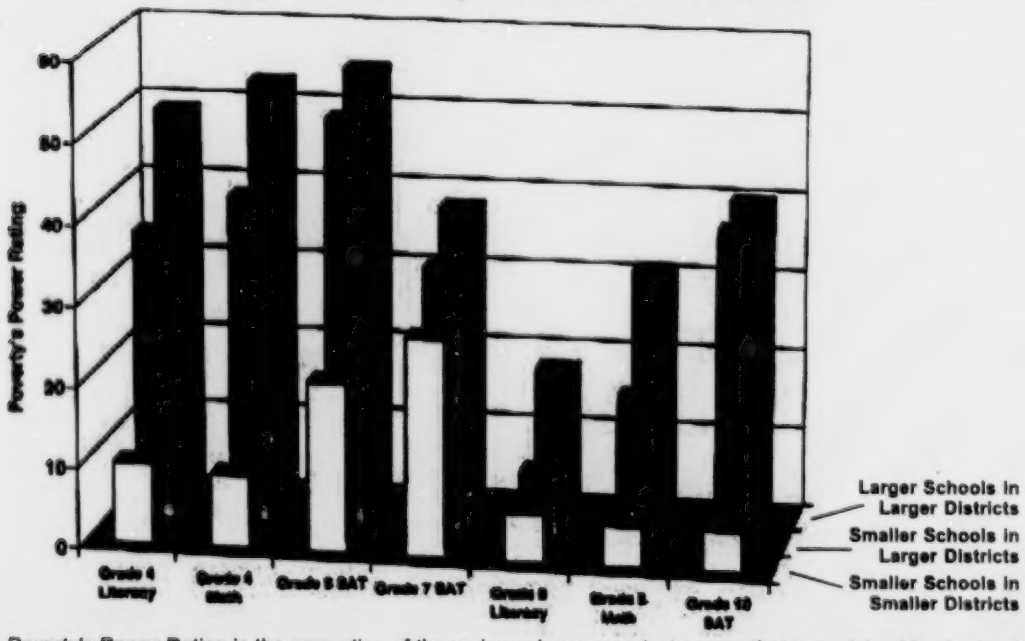
	Larger Schools in Larger Districts	Larger Schools in Smaller Districts	Smaller Schools in Larger Districts	Smaller Schools in Smaller Districts
Grade 4				
Benchmark — Literacy	49	*	36	10
Benchmark — Math	53	*	41	9
Grade 5				
SAT 5	55	*	51	21
Grade 7				
SAT 7	38	*	33	27
Grade 8				
Benchmark — Literacy	18	*	8	6
Benchmark — Math	31	*	18	5
Grade 10				
SAT 10	40	*	39	25

*Insufficient number of cases to calculate statistic.

Notes: Larger" means above median sized enrollment; "Smaller" means below median sized enrollment. The "Power Rating" is the portion of the variance for achievement scores that can be explained by the level of poverty in the school as measured by free and reduced price lunch. It is calculated by squaring the correlation coefficient.

Figure 3. Arkansas' Smaller Schools Are Most Effective Against Poverty When Part of Smaller Districts, and Less Effective When Part of Larger Districts.

Larger Schools in Larger Districts Are Least Effective.



Poverty's Power Rating is the proportion of the variance in average test scores that is explained by the level of poverty among students in a school.

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